

## Prosody



The aim of this application is the objective assessment of prosodic disorders, particularly in case of neurological troubles (ex: Parkinsonians)  
It is also useful to assess the speech expressivity (ex : laryngectomised)

## Principle

1. The subject is recorded in spontaneous condition or reading sentences, text...
2. Four windows are displayed corresponding to the sound, the melody, the intensity (dB) and the pause detection
3. It is possible to study :
  - melodic patterns
  - intensity patterns
  - utterance duration / syllabic rate
  - pause placement along the discourse

## Preparation

### Equipment

1. Plug the microphone in the INPUT 1-LEFT
2. Place the patient at 30 cm from the on stand microphone.
3. Ensure yourself that he does not move

### Software

Launch the SESANE software by clicking this icon in Windows task bar.



In SESANE, enter the patient information :



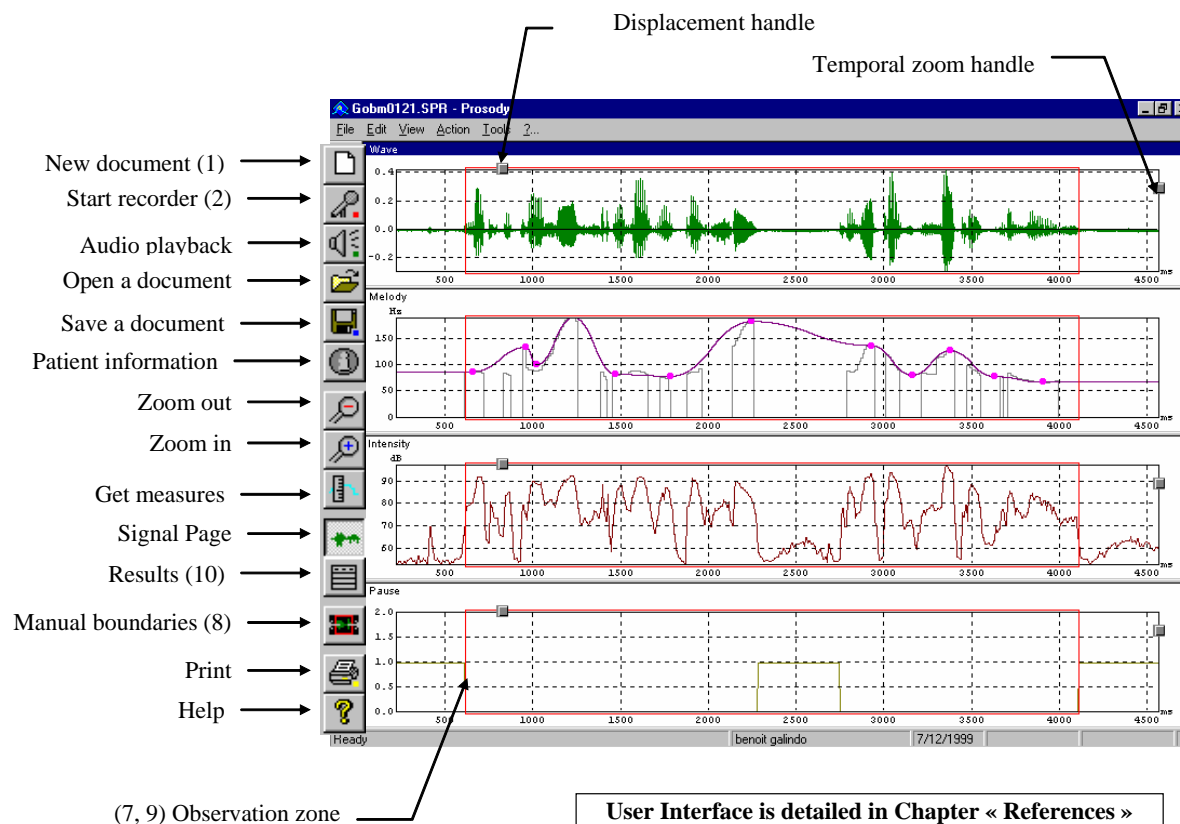
Patient Informations



Then double click on this icon :

## Using Prosody

### Main Window



User Interface is detailed in Chapter « References »  
 § Menus & keyboard    § Signal Manipulation

### Protocol

- (1) Create a new document if necessary
- (2) Start the recorder.

*The recording control window appears.*

### **Wait 3 seconds before speaking**

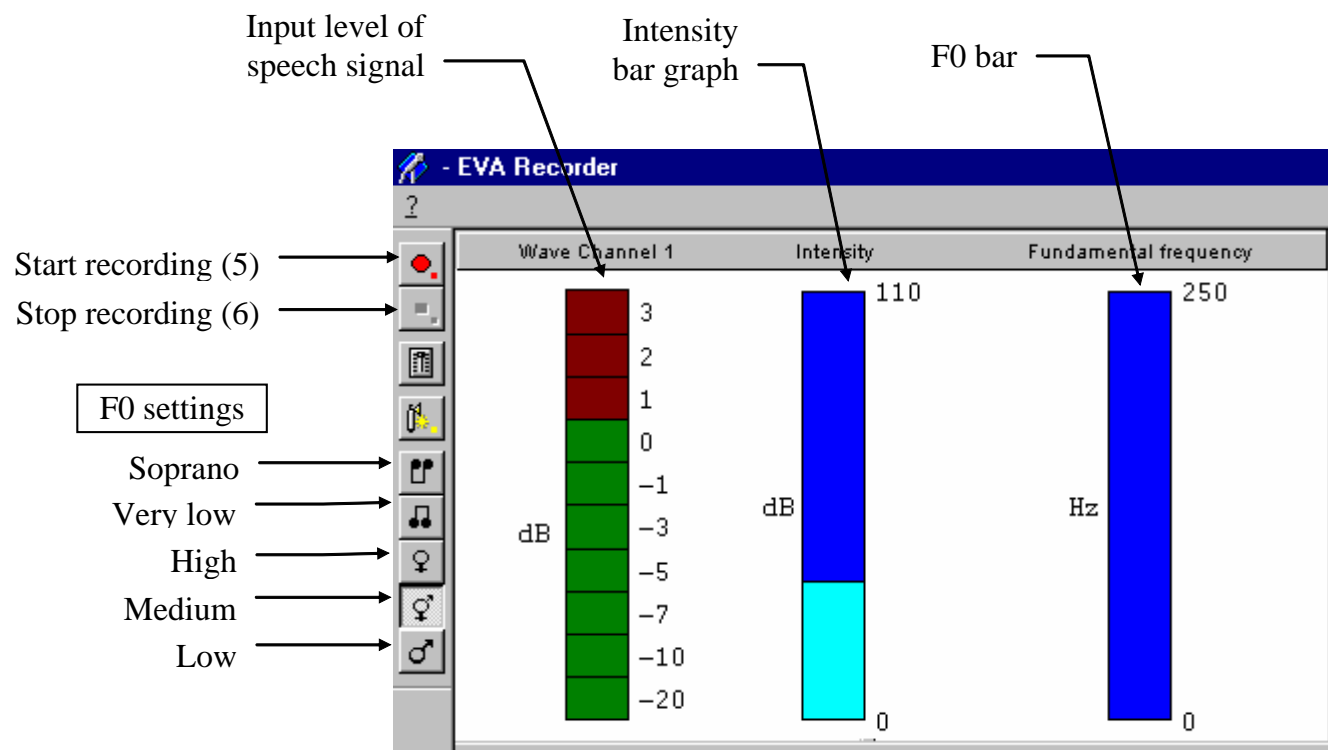
Patient can speak to test the level.

- (3) Verify the recording level of the acoustic input vu-meter. Beware of not reaching +3 dB while recording. If necessary, adjust the volume button of INPUT 1-LEFT.
- (4) Set up the register of fundamental frequency depending on the patient tessitura.
- (5) Start recording. The patient produces its utterance.
- (6) Stop recording.

*The main window appears*



## Recording control window



(7) The observation zone appears automatically if a silent is present at the beginning and at the end.

(8) You can also set manually the boundaries. To do that,

- select a zone (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release)
- press the icon (9)

(9) You can move this zone if necessary. To move,

- place the mouse pointer near the cursor
- click and hold down the left mouse button
- move the mouse where you want
- release the left button.

(10) The results appear in the result page.

You can create again an automatic observation zone by selecting the *Automatic boundaries* in the *Action Menu*.

Save the document.

Print the document.

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## Measurement

Prosody assessment is performed on an observation zone chosen on the recorded signal.

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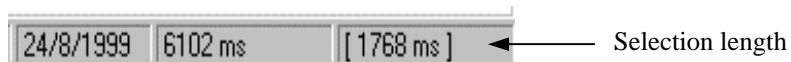
### Observation zone creation


The observation zone appears automatically if a silent is present at the beginning and at the end of the utterance. This zone starts at the end of the initial silence and finishes at the beginning of the final silence.

You can also define manually this zone. All the analysis will be computed again.

To define manually a zone :

1. select a part of signal (place the mouse pointer at the beginning, press and hold down the Shift key + left mouse button, move the mouse until the end and release).  
You can control the length of your selection by watching in the status bar.



2. click on the icon of zone transformation :   
or select the menu « Action / Manual Selection »  
or use the keyboard accelerator « S »

The analysis zone is enlarged to the size of the selected zone, and the statistics are immediately performed.

To define automatically the observation zone :  
select the menu « Action / Automatic Boundaries»  
or use the keyboard accelerator « A »

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### Observation zone placement

To move the observation zone :

1. place the mouse pointer near the left edge of the zone cursor,
2. click the left mouse button and maintain it down,
3. move the analysis zone,
4. release

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### Results display

Results are displayed in statistics page which contains numerical and graphical results.  
To switch between these pages use these icons :

Statistics :  Signal 

You can also change the current page by

- selecting the menu « View | Switch to xxx page »
- OR by using the keyboard accelerators « 1 », « 2 »

## Melody

The program displays statistics and graphics about melody. The analysis is computed on the observation zone using the modelled melody (cf. Technical note, p.10). Only data out of a silent pause are processed.

### Numerical results :

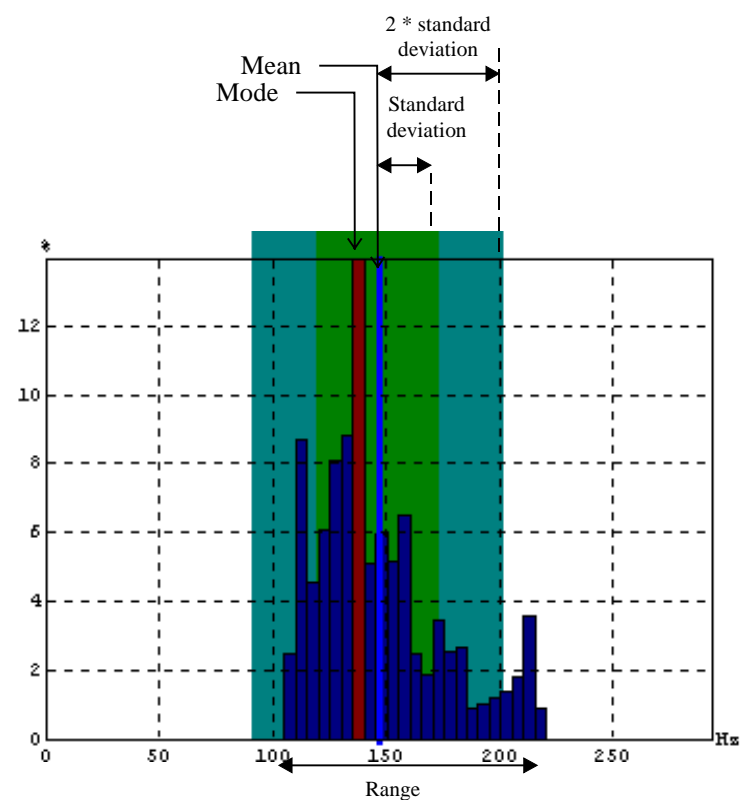
In general, mean and mode provide information about « usual » pitch. Standard deviation, coefficient of variation and range provide information about melodic dynamic.

These values are very dependent of the phonetic material : text, spontaneous speech, sentence...

	Frequency	½ tones
Mean	146.6 Hz	D2
Mode	[135.0 140.0] Hz	C#2
Std dev	27.7 Hz	3.0
Coeff. of variation	18.9 %	-
Min	109.9 Hz	A1
Max	215.7 Hz	A2
Range	105.8 Hz	11.7

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### Distribution :



A reticule is available to take measure (just click on the distribution graph and move the mouse holding down the left mouse button) .

## Intensity

The program displays statistics and graphics about intensity. The analysis is computed on the observation zone. Only data out of a silent pause are processed.

### *Numerical results :*

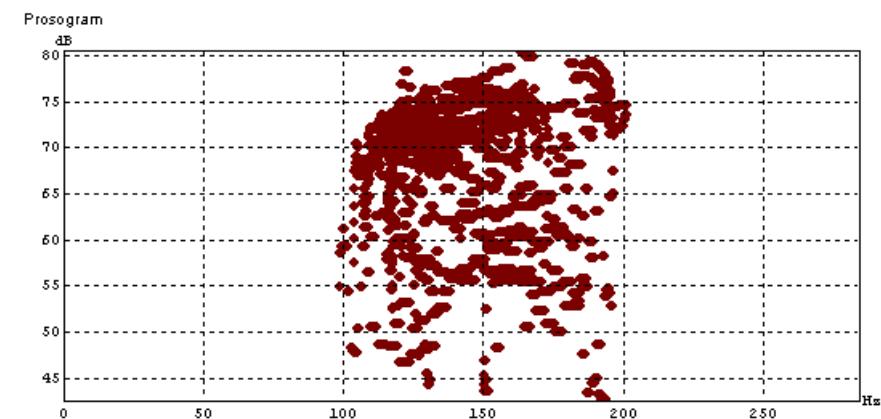
In general, mean and mode provide information about « usual » intensity. Standard deviation, coefficient of variation and range provide information about intensity dynamic.

These values are very dependent of the phonetic material : text, spontaneous speech, sentence...

Intensity	
Analysis zone [0.4 ; 9.0 s]	Parts without silence
Mean	67.2 dB
Mode	[70.0 75.0] dB
Std dev	7.9 dB
Min	42.6 dB
Max	80.7 dB
Range	38.1 dB

## Prosogram

The prosograph is a frequency/intensity display. It is the same view as a phonetogram on running speech recorded with the prosody application.



## Pauses

The program displays statistics and graphics about silent pauses. The analysis is computed on the observation zone using the pause detection (cf. Technical note, p.10).

### Numerical results :

Only silent pauses are detected. We call signal the non silent parts of the sound wave.

	Pause	Signal	Total
Duration (sec.)	3.233	9.927	13.160
%	24.6 %	75.4 %	100 %
Nb.	7	8	15
Mean duration (sec.)	0.462	1.241	0.877

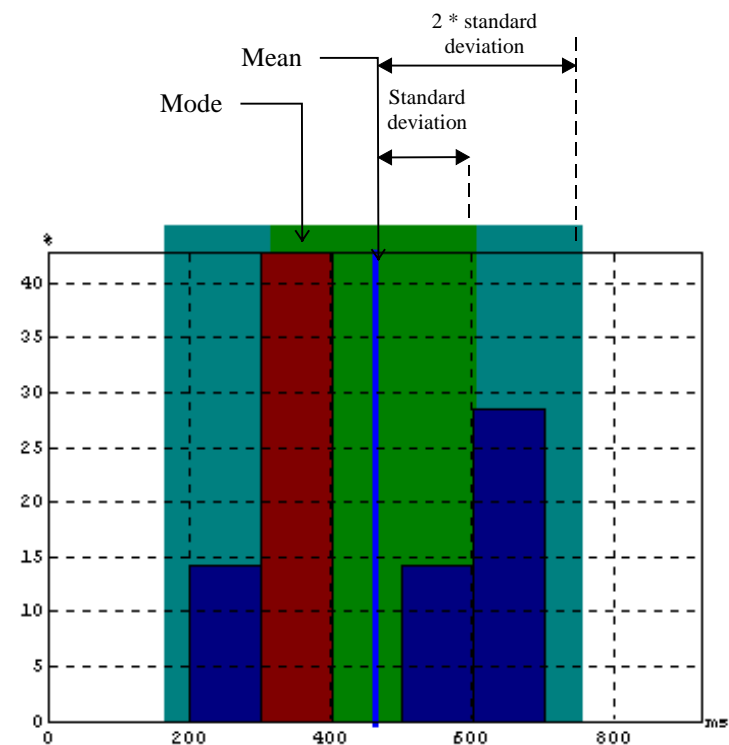
Cumulated duration  
 Ratios  
 Counting  
 Mean = Cumulated duration / Nb

### Explanation

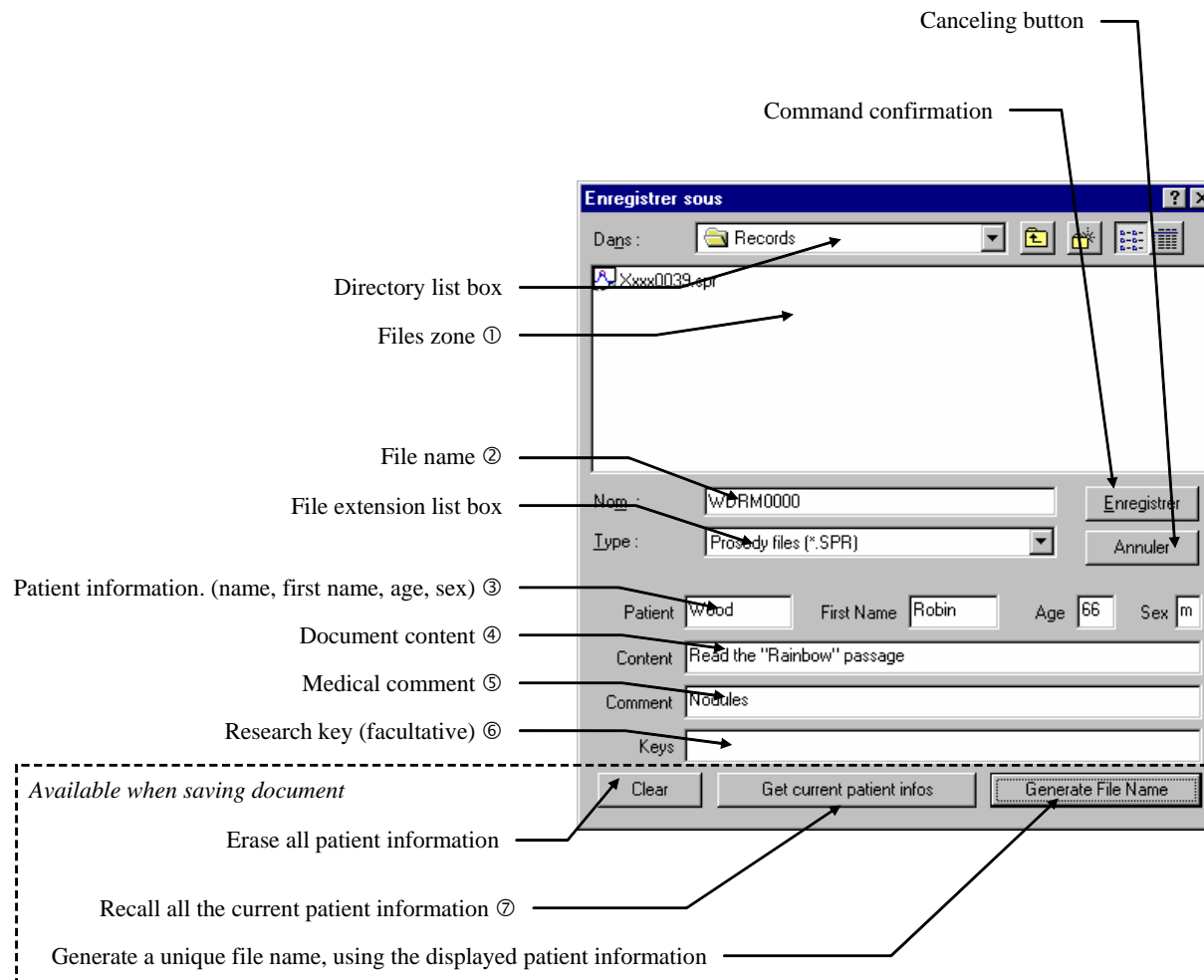
The patient has spoken during 13,16 ms. During this time, 7 pauses were performed. All these pauses account for 24.6% of the time.

### Distribution :

The pauses distribution provides information about individual pause duration.



## Data Management



### Save a document

Method 1 : Click on ⑦. The current patient information appear in the fields ③, ④, ⑤, ⑥. A unique filename is automatically generated in ②. Confirm by clicking on ⑨.

Method 2 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Click on ⑧. A unique filename appears in ②. Confirm the saving by clicking on ⑨.

Method 3 : Enter manually the patient information in the fields ③, ④, ⑤, ⑥. Enter a file name in ①. Confirm the saving by clicking on ⑨.



### Open a document

Select a document in ① by a single click with the left mouse button.. The file name appears in ② with its information as well in ③, ④, ⑤ ⑥. Confirm your choice by clicking on ⑨.



### To obtain information about the current document



## Options

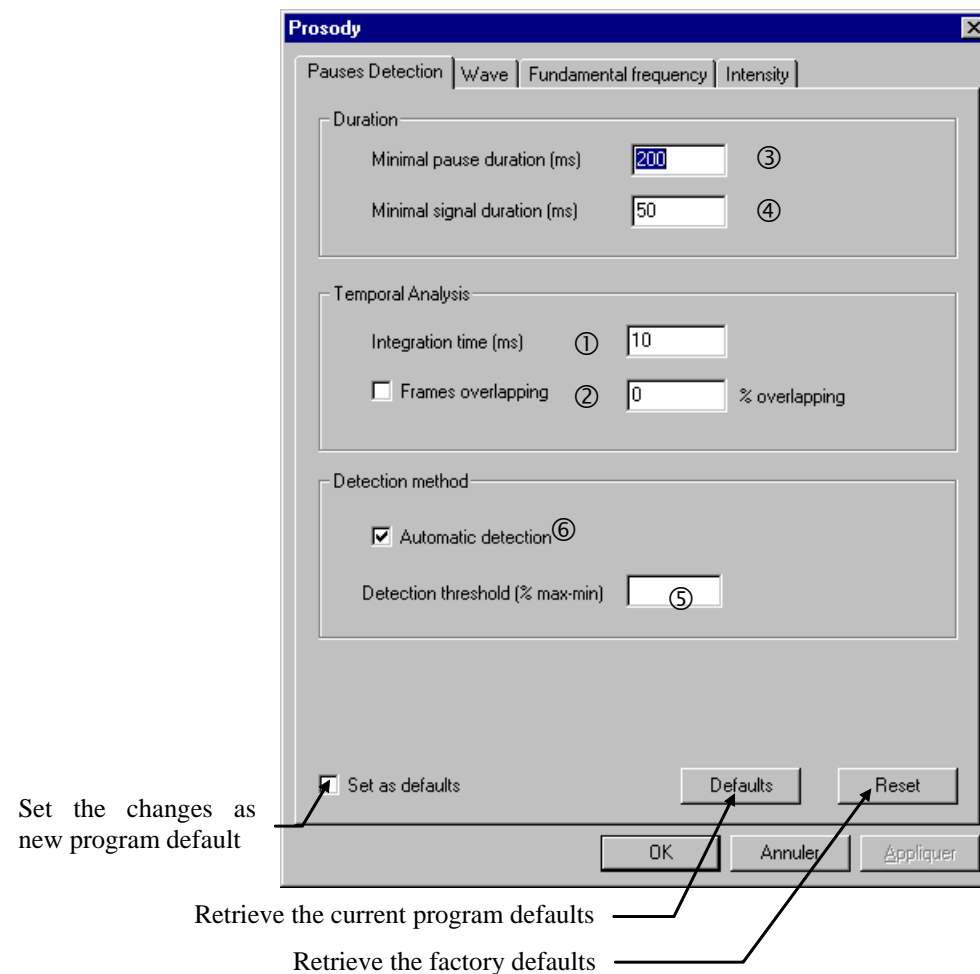
You can modify the program parameters by selecting the menu « Tools | Options » or by typing the « O » key. You can also use « Properties » object menu (right mouse button).

The specific options of this application are following.

### Pauses detection

Pause detection is based on silence analysis. The energy is computed on successive frames whose length is called *Integration Time*. According to these energies measured, the algorithm distinguishes low energy frames (silence) and high energy frames (signal). Different parameters can set this automatic algorithm.

- ① *Integration time* (in ms) is the length of the analysis frame. 10 ms is a typical value which is long enough to smooth very quick events and which is short enough to obtain a satisfactory grain.
- ② The energy analysis is performed on successive frames. These frames can be completely placed side by side or can be overlapped. The *overlapping* parameter is available to set this computation. The 0 value means that the frames are placed side by side.
- ③ *Minimum pause duration* (in ms) is necessary to avoid that the algorithm considers as a pause a short silence as, for example, in the case of unvoiced plosives (a short silence appears between /o/ and /t/ in the word « potatoes »)
- ④ *Minimum signal duration* (in ms) is necessary to avoid that the algorithm considers as signal a short noise.
- ⑤ *Detection Threshold* (in %) is the value where all analysis frames greater than this threshold are considered as signal. If you increase this threshold, some parts of the sound wave will be detected as silences. If you want to let the algorithm computing automatically this threshold, click on *Automatic Detection* ⑥.



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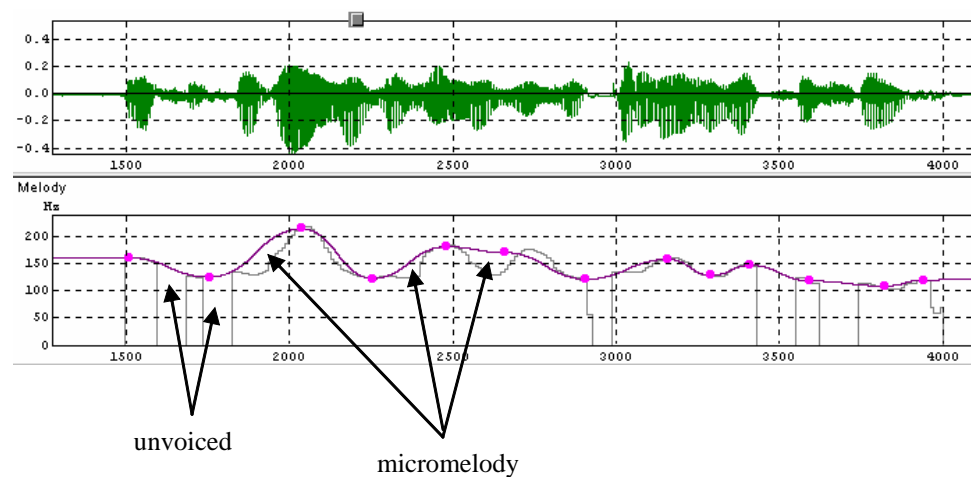
## Technical note

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### Modelled Melody

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The modelled melody is computed with the MOMEL method<sup>\*</sup>. These targets correspond to relevant local variations of melody. They are linked by a quadratic spline interpolation function. They are useful to retrieve the suprasegmental pattern where all the micromelodic variations or unvoiced segments are not taken into account.



The analysis is computed on the observation zone using the modelled melody. Only data out of a silent pause are processed.

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<sup>\*</sup> Hirst D.J. & Espesser R. (1993), « Automatic modelling of fundamental frequency using a quadratic spline function ». Travaux de l'Institut de Phonétique d'Aix, vol.15, 71-85